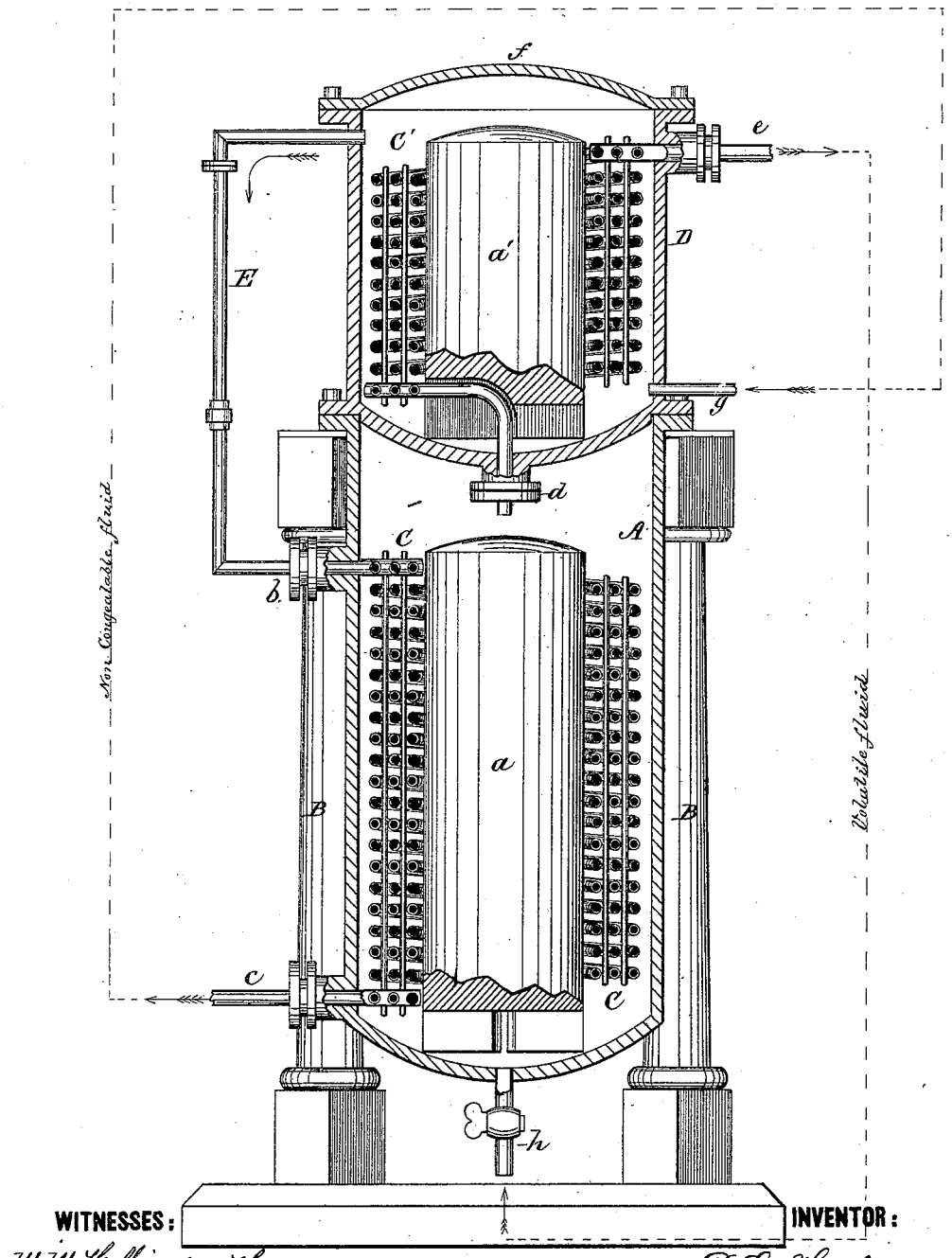
D. L. HOLDEN.

Apparatus for Refrigerating the Non-Congealable Liquid Employed in the Manufacture of Ice.

No. 205,642. Patented July 2, 1878.



WITNESSES:

W. W. Hollingsworth

Edw. C. Byrn

INVENTOR:

D. L. Holden

BY

Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE

DANIEL L. HOLDEN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR REFRIGERATING THE NON-CONGEALABLE LIQUID EMPLOYED IN THE MANUFACTURE OF ICE.

Specification forming part of Letters Patent No. **205,642**, dated July 2, 1878; application filed May 9, 1878.

To all whom it may concern:

Be it known that I, DANIEL L. HOLDEN, of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Ice-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which the figure is a vertical section, with the circulating-currents indicated in dotted lines.

My invention is an improvement in that class of ice-machines in which a non-congealable fluid is employed as a vehicle for conveying the cold from the refrigerating-chamber to the congealer or place where the ice is formed.

The improvement is upon the feature known as the "refrigerator," and is designed to secure the greatest refrigerating effect of the volatilized liquid by causing it to impart a certain degree of cold to the non-congealable liquid when evaporated from a bulk of the volatile fluid in one chamber, and to impart a further degree of cold to said non-congealable liquid by a further expansion of the volatile fluid in another chamber.

The invention consists, mainly, in the combination of two containing-cases, having separate sets of coils, the coil in each case being in communication with the space about the coil in the other case, so that the volatile fluid passes through the open space of one cylinder or case and the coils of the second, while the non-congealable fluid passes through the coils of the first cylinder and open space of the second, as hereinafter fully described.

In the drawing, A represents a vertical cylinder sustained upon standards B. C is a manifold coil of pipes arranged about a central displacing-core, *a*, and having an inlet-connection, *b*, and an outlet-connection, *c*, extending through the side of the cylinder.

D is a second cylinder, placed above the first, and having communication from its top portion with the coil in the cylinder below through the pipe E. Within this upper cylinder, and about a central displacing-core, *a'*, is arranged a second manifold coil, C', having through the bottom of the cylinder D an inlet-connection, *d*, and through the side of the cylinder an outlet-connection, *e*.

The upper cylinder has a flanged base, which rests upon and is bolted to a flange upon the upper surface of the lower cylinder. It is also further provided with a removable head, *f*, and near its bottom with an inlet-pipe, *g*.

Now, the connection of the coil-pipes with the sides of the cylinders being made tight by means of stuffing-boxes, the operation of this device is as follows: The non-congealable fluid, kept in circulation by suitable pumps, enters the upper cylinder at the bottom through the pipe *g*, and leaves it at the top through pipe E, passing from the space about the coils in the upper cylinder to the interior of the coils in the lower cylinder, and, after having been refrigerated, as hereinafter described, passes out at *c* to the point of utilization, from which it returns again through pipe *g* for a second reduction of its temperature.

In selecting a volatile fluid, I employ aqua ammonia of from thirty-two to thirty-eight per cent., boiling at from +3 to −6 centigrade; but any other volatile fluid, such as cymogene, sulphurous oxide, ether, gasoline, &c., may be used.

The chamber A being partially filled with this concentrated ammonia, as fast as the pressure is removed by the pump through the pipe *e* of the upper coil the vapors of ammonia are evolved in the cylinder A, and, passing up, around, and between the manifold coil C, cause a reduction of the temperature in the non-congealable fluid contained therein. These vapors, after passing around the coils of the lower cylinder, enter the pipe *d* at the top, and then pass into the upper coil C', where, by continued expansion, a further degree of cold is produced upon the non-congealable liquid, which in this cylinder surrounds the pipes, instead of being inside of the same, as in the lower cylinder. After traversing the upper coils C' the vapors pass off at *e* to the condenser, where they are liquefied, and are again returned to the lower cylinder through pipe *h*.

With respect to the function of the cores *a* *a'*, these are only employed to displace a portion of the liquid in the cylinder and cause

the traversing currents of gas in the lower cylinder and liquid in the upper cylinder to pass directly through the coils with a more intimate contact.

The device, which has thus been described as a refrigerator, may also be employed as a condenser for the volatile gas, a circulating current of simple cold water being employed in the upper cylinder and lower coil to condense the gas admitted to the upper coil and lower cylinder.

Having thus described my invention, what I claim as new is—

1. The combination of two containing-cylinders or cases, having separate sets of coils, the coils of each cylinder being in communication with the space about the coils in the other cylinder, substantially as shown and described.

2. The combination, with the cylinder A and coil C, of the cylinder D and coil C′, the cylinder D having an inlet, *g*, near the bottom, and an outlet, E, near the top, communicating with the coil C below, substantially as shown and described.

D. L. HOLDEN.

Witnesses:
SOLON C. KEMON,
EDW. W. BYRN.